UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

Refer to:
2002/01097

October 6, 2003

Mr. Lawrence C. Evans
U.S. Army Corps of Engineers, Attention: John Barco
Regulatory Branch, CENWP-CO-GP
PO Box 2946
Portland, OR 97208-2946

Re: Endangered Species Act Formal Section 7 and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Joe Bernert Towing Company Instream Gravel Mining Project, Lower Willamette River Basin, River Miles 27 - 56.6, Clackamas, Marion, and Yamhill Counties, Oregon (Corps No. 199601626)

Dear Mr. Evans:

Enclosed is a biological opinion (Opinion) prepared by NOAA's National Marine Fisheries Service (NOAA Fisheries) pursuant to section 7 of the Endangered Species Act (ESA) on the effects of issuing a permit under section 10 of the Rivers and Harbors Act for the proposed Joe Bernert Towing Company Instream Gravel Mining, in the Willamette River in Clackamas, Marion, and Yamhill Counties, Oregon. In this Opinion, NOAA Fisheries concludes that the proposed action is not likely to jeopardize the continued existence of ESA-listed Upper Willamette River chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*O. mykiss*). As required by section 7 of the ESA, NOAA Fisheries also includes reasonable and prudent measures with nondiscretionary terms and conditions that NOAA Fisheries believes are necessary to minimize the impact of incidental take associated with this action.

This document also serves as consultation on essential fish habitat pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations at 50 CFR Part 600.

If you have any questions regarding this consultation, please contact Anne Mullan of my staff in the Oregon Habitat Branch at 503.231.6267.

Sincerely,

for Michael R Crouse

D. Robert Lohn
Regional Administrator

cc: Patty Snow, ODFW
Tom Melville, ODEQ
Lori Warner, DSL
Yvonne Vallette, EPA
Tom Bernert, Bernert Towing Company
Joe Bernert, Bernert Towing Company
John Marshall, USFWS
Janine Castro, USFWS

Endangered Species Act - Section 7 Consultation
Biological Opinion

&

Magnuson-Stevens Fishery Conservation and Management Act
Essential Fish Habitat Consultation

Joe Bernert Towing Company Instream Gravel Mining
Lower Willamette River Basin, River Miles 27 - 56.6
Clackamas, Marion, and Yamhill Counties, Oregon
(Corps No. 199601626)

Agency:	U.S. Army Corps of Engineers
Consultation Conducted By:	National Marine Fisheries Service, Northwest Region
Date Issued:	October 6, 2003
Issued by:	for Michael R Crouse D. Robert Lohn Regional Administrator
Refer to:	**2002/01097**

TABLE OF CONTENTS

1. INTRODUCTION

The Endangered Species Act (ESA) of 1973 (16 USC 1531-1544), as amended, establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat on which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with NOAA's National Marine Fisheries Service (NOAA Fisheries), as appropriate, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitats. This biological opinion (Opinion) is the product of an interagency consultation pursuant to section 7(a)(2) of the ESA and implementing regulations found at 50 CFR 402.

The analysis also fulfills the essential fish habitat (EFH) requirements under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal fisheries management plan. Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (§305(b)(2)).

1.1 Consultation History

In July 2001, the Army Corps of Engineers (COE) requested consultation on the issuance of a multi-year mining permit for sites extending from river mile (RM) 27 to 56.5 of the Willamette River in Clackamas, Marion, and Yamhill counties of Oregon. This was followed by meetings in 2001 which led to a revised proposal for consultation on a one-year permit extension of the current permit and a second request for the multi-year permit renewal. For the one-year permit extension, the COE proposed in February, 2002, to authorize the one-time removal of sand and gravel from three locations: (1) Mining 50,000 cubic yards of gravel at Ash Island (RM 52); (2) mining 25,000 cubic yards of gravel and rock at Peach Cove (RM 35); and (3) mining 35,000 cubic yards of sand and gravel at Caffall Brothers site (RM 31). A biological opinion was completed on March 4, 2002, for these actions (refer to: 2001/01125). Following this consultation, the COE proposed to authorize the multi-year renewal of the permit. Specific information about areas to be mined in 2003 was provided in a letter received by NOAA Fisheries on October 11, 2002. After further discussion between the COE, the applicant, and NOAA Fisheries, the consultation request was modified in a letter received by NOAA Fisheries on December 27, 2002. In that letter, the COE determined that Upper Willamette River (UWR) chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*O. mykiss*) are "likely to be adversely affected" (LAA) by the in-water mining and proposed to issue a final five-year permit, ending in January, 2008. According to the Bernert Towing Company, it will no longer practice instream mining after this permit expires.

At meetings and a site visit in early 2003, the applicants provided details on restoration activities, specific mining sites, and conservation practices to avoid and minimize adverse effects during the five-year phase out. On May 23, 2003, a final meeting with the COE and the applicants provided an opportunity to discuss remaining concerns. The applicant further modified the proposed action with a letter received by NOAA Fisheries on June 4, 2003, with attachments showing volumes proposed for removal over the next four years, cross-sectional profiles for proposed mining areas, and proposed post-mining depths for areas to be mined during the first year.

This Opinion is based on the information presented in the BA and supplementary documents, a site visit, and discussions with COE, and considers the potential effects of the proposed action on UWR chinook and steelhead. NOAA Fisheries listed UWR chinook salmon as threatened under the ESA on March 24, 1999 (64 FR 14308) and UWR steelhead on March 25, 1999 (64 FR 14517). NOAA Fisheries issued protective regulations for UWR chinook salmon and UWR steelhead under section 4(d) of the ESA on July 10, 2000 (65 FR 42422). Additional references and biological information are available in Busby *et al.* 1996, Myers *et al.*1998 and Healey 1991.

1.2 Proposed Action

1.2.1 Gravel Mining

The mining operation includes the extraction, transport, and processing of sand and gravel. A barge-mounted clamshell dredge will be used for extraction. The equipment is anchored in the streambed by steel piles. The extracted material is deposited on a second transport barge, with a capacity of approximately 400 cubic yards. The rate of extraction is approximately 150 cubic yards per hour.

Areas proposed for mining are selected from 24 areas mined previously in river miles 27 to 56.5, beginning a short distance above the Willamette Falls area and continuing to one mile above the Yamhill River confluence. Proposed approximate volumes are shown in Table 1. The amounts shown were estimated for the years 2003 to 2007, and may be adjusted annually to minimize effects and provide materials for mixing from different depths. Detailed cross-sectional profiles for 2003 sites were completed, except site 16 (Eilers Road), site 18 (Canby Ferry), and site 20 (Peach Cove).

To determine the sites and volumes, the applicant used these guidelines to minimize effects:

1. Maintain 100-foot setbacks and side slopes of 4 horizontal to 1 vertical.
2. Maintain bed depths at existing levels where less than 20 feet.
3. In areas deeper than 20 feet, maintain average thalweg depth to avoid channel incision.
4. Refrain from mining in areas within one-half mile of tributary confluences, including the Yamhill, Chehalem, Mollala, Champoeg, and Tualatin Rivers.
5. Move mining toward downstream areas over the permit period to begin recovery of upstream areas, and to avoid deepening shallow upstream areas.
6. Follow permit maximum depths, except where above restrictions are more protective.

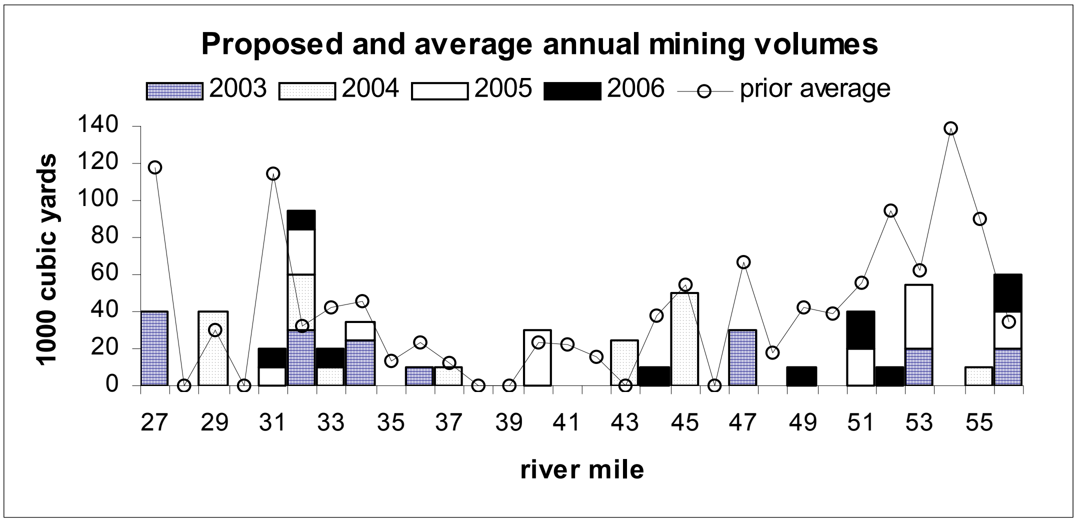
Table 1. Bernert Gravel Mining Sites and Annual Proposed Volumes (depth in feet, annual volume in 1000 cubic yards)

Site	Approx. thalweg depth	Max. permit depth	Site Name	River miles	2003	2004	2005	2006	Total
1	-6 to -13	-10	San Salvador Landing	56 - 56.5	20		20	20	60
2	-20	-10	Mission Bar	55.4 - 55.7		no extraction			0
3	-15	-10	Yamhill confluence - upstream	55 - 55.2		10			10
4	-17	-10	Yamhill confluence - downstream	54.5 - 55		no extraction			0
5	-15 to -35	-20	Dundee Bar	53 - 54	20		35		55
6	-15	-20	Power line	52.6 - 52.7				10	10
7	-12	-20	Ash Island	50.8 - 52			20	20	40
8	-30	-35	Below Ash Island	50.3 - 50.8		no extraction			0
9	-25	-35	between Newberg bridges	49 - 49.8				10	10
10	-20 to -35	-35	below 219 bridge	47.2 - 48	30				30
11	-25	-35	Champoeg Park	45.6 - 46.5		50			50
12	-30	-35	Lower Champoeg	44.3 - 45				10	10
13	-27	-35	Butteville	43 - 43.1		25			25
14	-22	-35	Chicken Ranch	40.6 - 40.7			30		30
15	-30	-35	Montgomery Way	37.3 - 37.6		10			10
16	-30	-35	Eilers Road	36.1-36.8	10				10
17	-33	-35	Mollala River Confluence	35.5		no extraction			0
18	-28	-35	Canby Ferry	34.7 - 35	25		10		35
19	-60	-35	Canby log dump	33.8 - 33.9		10		10	20
20	-21	-35	Peach Cove	32.6 - 33.2	30	30	25	10	95
21	-20	-35	New Era Bar/ Willow Island	31.5-32		no extraction			0
22	-47	-35	Caffal Bros mill site	31.0 - 31.1			10	10	20
23	-35	-40	below Rock Island	29.2 - 29.3		40			40
24	-35 to -40	-50	Canema area	27-27.9	40				40
				TOTALS	**175**	**175**	**150**	**100**	**600**

The proposed action includes phasing out over the four years shown in Table 1, with annual reductions in volume. Some areas will not be dredged to protect habitat in the Willamette River and to prevent long-term adverse effects to tributary confluences. Restoration actions are also proposed to further minimize long-term effects, and are described below.

For purposes of determining maximum depth at each site, since river depths vary annually and are affected by the gravel mining, cross-sectional profiles will be measured and submitted for review before each year's mining activities. These will be based on fixed benchmarks and referenced to the National Geodetic Vertical Datum (NGVD). Spacing between cross sections will be a maximum of 300 feet, and a minimum of three profiles will be measured at each proposed site. After the cross sections are run, the proposed depth and volumes for each area will be submitted for review. The estimated total volumes proposed by area is as shown, along with historic average annual volumes removed in Figure 1. A map of the mining areas within the Willamette River Basin is shown in Figure 2.

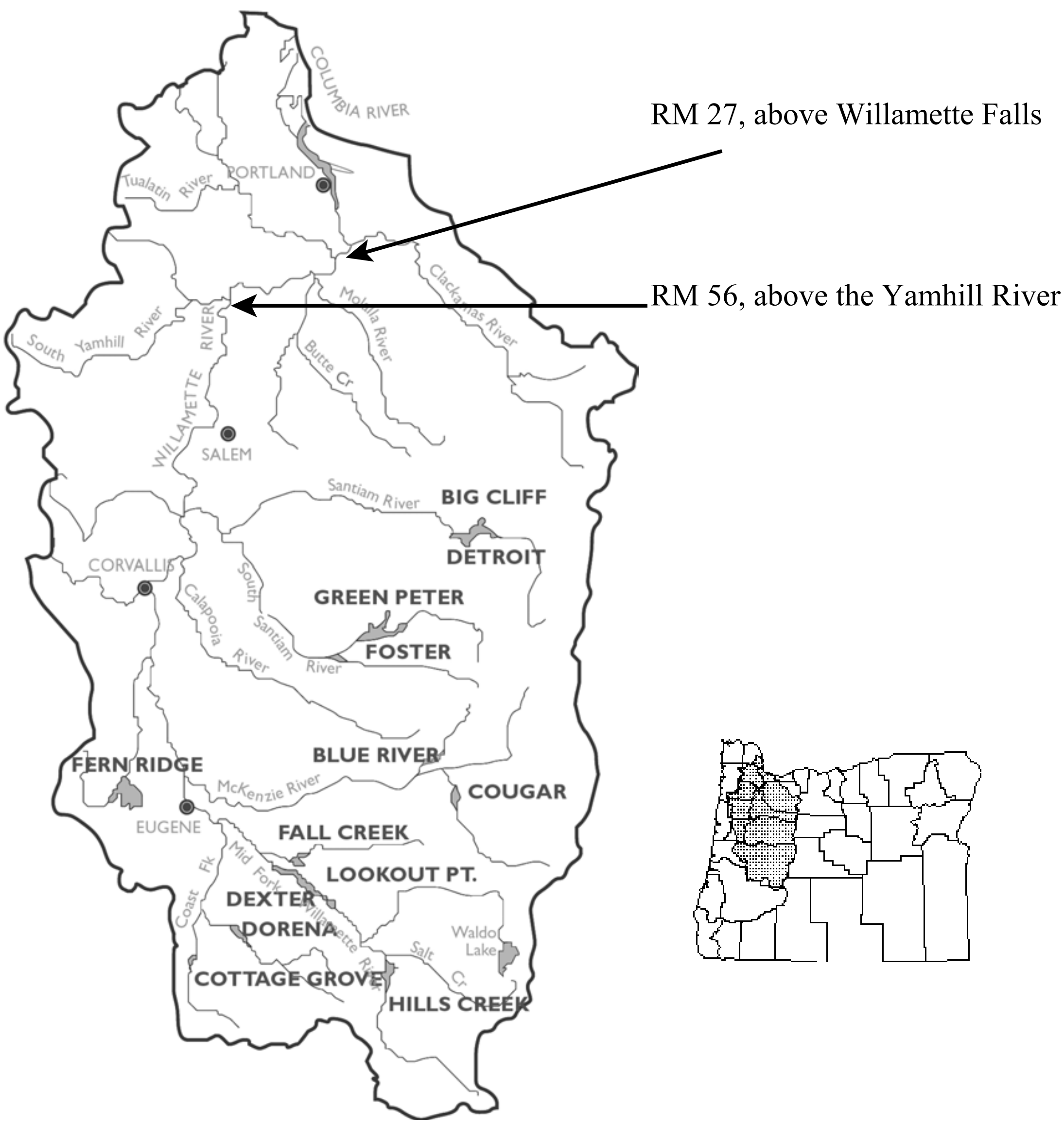
Figure 1. Annual volumes proposed for removal 2003-2006, and the prior annual volume averaged over years mined. River miles with no volumes proposed are restricted for infrastructure or habitat protection.



To reduce overlap of activities with peak juvenile outmigration, applicants will observe the following in-water work dates:

Willamette Falls to Newberg: (RM 27 to 50)	June 1 - October 31, December 1 - January 31
Newberg to McKenzie River: (RM 50 to 55)	June 1 - September 30

Figure 2. Map of the Willamette River Basin showing major tributaries and the location of 13 COE flood control projects (Source: USACE *et al.* 2000).



1.2.2 Restoration Activities

The applicant proposes to minimize effects of the gravel mining by restoring riparian and streambank functions, and floodplain connectivity. Annual descriptions of proposed activities will be provided by the applicant to the COE, falling under these categories:

1. Restoring stream and creek riparian area vegetation.
2. Opening passage to side channels in the floodplain beside mined river miles.
3. Providing bank erosion protection with large wood or boulders.
4. Partially filling areas previously mined below allowed depths (*e.g.*, Mission Bar).

For 2003, preliminary descriptions of the first project, restoration of a creek known as Seeley Ditch on Joe Bernert Towing/ Wilsonville Concrete Products' (JBT/WCP) property were provided. This creek has eroding banks and barriers to passage. The proposal includes revegetation and culvert replacement. JBT/WCP will coordinate with the City of Wilsonville, Clackamas County, and local watershed groups on this project (J. Bernert, personal communication with A. Mullan, NOAA Fisheries, 28 May 2003, email).

1.2.3 Monitoring Activities

In the month before the mining activities, an annual bathymetric pre-survey consisting of a series of cross-sectional profiles of the proposed areas will be completed. Within two weeks following the mining, a post-survey will be completed. Each survey will have transects spaced no farther than 300 feet apart, with a minimum of three transects per mined area. The surveys will use global positioning systems (GPS) with an echo sounder, and will convert river depths to NGVD elevation using referenced gaging stations. Staff gages will be installed on at least four locations on stream banks before excavation. The cross sections will provide data to estimate the thalweg profile. The GPS latitude and longitude of each transect will be recorded to allow post-surveys in the same places, along with photo documentation. If satellite reception for the GPS unit is unavailable, or if depth signals are distorted, standard field mapping and soundings will be used. Some of the pre-surveys for the 2003 locations have been submitted as part of the proposed action.

1.3 Description of the Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area (project area) involved in the proposed action (50 CFR 402.02). The direct effects occur at or beyond the project site based on the potential for upstream or downstream effects in the action area (*e.g.*, simplification of channel, loss of sediment supply downstream, alteration of stream channel morphology, increases in total suspended solids , and displacement, injury to, or killing of salmon). Indirect effects may occur at or beyond the project site when the proposed action leads to additional effects that contribute to aquatic habitat degradation. For this consultation, the action area includes individual areas proposed for mining and 300 feet upstream and downstream from the top of the setback areas, excluding tributary confluences, from RM 27 to RM 57.

2. ENDANGERED SPECIES ACT

2.1 Biological Opinion

2.1.1. Biological Information

Individuals and populations of the UWR spring chinook and UWR steelhead ESUs complete a substantial part of their freshwater life history requirements in the proposed action area. The timing of their life history stages is shown in Table 2. Upstream migration for species in these ESUs is timed to coincide with spring flows over Willamette Falls. All fish migrating to or from upstream tributaries will pass through the area of the mining sites.

While a portion of spring chinook rear in the tributaries, some spring chinook fry migrate downstream from the tributaries into the mainstem Willamette River during the winter and spring to rear. In addition to being a migration corridor for all anadromous salmonids that spawn in tributaries of the Willamette, juvenile anadromous salmonids rear in the mainstem Willamette River. Kenaston (2003) documented chinook rearing in the mainstem Willamette River from the confluence with the McKenzie River to Newberg, and noted fingerling chinook overwintering in valley floor tributaries of the Willamette that do not contain spawning populations of salmon. Bayley and Baker (2000) and Bayley *et al.* (2001) document juvenile chinook salmon rearing in off-channel gravel pits that were connected to the mainstem during high-flow events. Juvenile chinook also use upper Willamette River main channel habitat and alcove habitat, and seem to prefer alcoves that have been recently disturbed and contain open gravel substrate. Gregory *et al.* (2002a) further document juvenile salmonids using mainstem Willamette River alcoves on their outward migration. Fish habitat distribution maps were recently revised to include updated information showing rearing of both UWR spring chinook and winter steelhead throughout the mainstem from Willamette Falls to confluences with upper tributaries, *e.g.* the McKenzie River (ODFW 2002a, 2002b).

Bjornn & Reiser (1991) found that sites occupied by juvenile steelhead had higher velocities than the modal velocities in the stream and increased with increasing fish length and water temperature, although they were lower than the usual feeding sites velocities in a California stream. The same phenomena was seen in Idaho streams for both chinook and steelhead. One explanation posited was that invertebrate drift abundance increased with velocity, thereby providing a potential energetic benefit to occupying the higher velocity sites. In larger rivers, chinook fry are expected to migrate at the edges of the river, rather than in the high velocity water near the center of the channel. At night chinook have been found to move inshore to quiet water over sandy substrates or into pools and settle to the bottom, but return the next day to occupy the same riffle and glide areas that they had previously occupied (Healey 1991).

Table 2. UWR Spring Chinook and Winter Steelhead Salmon Life History Timing. Light shading represents low-level abundance, dark shading represents peak abundance (after USACE *et al.* 2000).

		J	F	M	A	M	J	J	A	S	O	N	D
Upstream Migration	Spr Chinook												
	Wtr Steelhead												
Spawning in Tributaries	Spr Chinook												
	Wtr Steelhead												
Intragravel Development	Spr Chinook												
	Wtr Steelhead												
Juvenile Rearing	Spr Chinook												
	Wtr Steelhead												
Juvenile Out-migration	Spr Chinook												
	Wtr Steelhead												

For the past year, NOAA Fisheries has been working with state, tribal and other Federal biologists to develop the updated information and analyses needed to re-evaluate the status of the Pacific salmon and steelhead ESUs. The NOAA Fisheries' Biological Review Team (BRT) for Pacific salmon and steelhead met recently to review this updated information, and reported preliminary findings about the status of each ESU. The results of that review are included in the "Draft Report of Updated Status of Listed ESUs of Salmon and Steelhead."[1]

As in the past, the BRT used a risk-matrix method to quantify risks in different categories within each ESU. In the draft status update, the method was modified to reflect the four major criteria identified in the NOAA Fisheries' Viable Salmonid Populations (VSP) document: Abundance, growth rate/productivity, spatial structure, and diversity. These criteria are being used as a framework for approaching formal ESA recovery planning for salmon and steelhead. Tabulating mean risk scores for each element allowed the BRT to identify the most important concerns for each ESU and make comparisons of relative risk across ESUs and species. These data and other information were considered by the BRT in making their overall risk assessments. Based on provisions in the draft NOAA Fisheries policy on artificial propagation in salmon listing determinations, the risk analyses presented to the BRT focused on the viability of populations sustained by natural production.

[1] This draft report is available online at http://www.nwfsc.noaa.gov/trt/brt/brtrpt.cfm.

The status review updates were undertaken to allow consideration of new data that have accumulated since the last updates and to address issues raised in recent court cases regarding the ESA status of hatchery fish and resident (nonanadromous) populations In some ESUs, adult returns of some populations over the last 1-3 years have been significantly higher than have been observed in the recent past. The BRT found these results, which affected the overall BRT conclusions for some ESUs, to be encouraging. This change reflects the larger adult returns over the past several years, which nevertheless remain well below preliminary targets for ESA recovery. Overall, although recent increases in escapement were considered a favorable sign by the BRT, the response was uneven across ESUs and, sometimes, across populations within ESUs. The UWR steelhead ESU was among the lowest scoring of all west coast steelhead ESUs.

The BRT noted that recent increases have not yet been sustained for a full salmon/steelhead generation and the causes for the increases are not well understood. In many cases, they may be due primarily to unusually favorable conditions in the marine environment rather than alleviation of the factors that led to widespread declines in abundance. Overall, the BRT felt that ESUs and populations would have to maintain themselves for a longer time at levels considered viable before it could be concluded that they are not at significant continuing risk.

These preliminary findings focus solely on the naturally-spawning portion of each ESU, and do not take into account the future effects of ongoing salmon conservation and recovery efforts. For the Upper Willamette River spring chinook and winter steelhead ESUs considered in this Opinion, the majority BRT conclusion was that they were "likely to become endangered in the foreseeable future". A summary of findings for the UWR spring chinook and winter steelhead ESUs is at the end of the following ESU-specific sections.

Upper Willamette River Spring Chinook

UWR spring chinook salmon migrate through, and rear, in the Willamette River in the action area. The UWR chinook salmon ESU includes native spring-run populations above Willamette Falls and in the Clackamas River. In the past, it included sizable numbers of spawning salmon in the Santiam River, the Middle Fork of the Willamette River, and the McKenzie River, as well as smaller numbers in the Molalla River, Calapooia River, and Albiqua Creek.

The total run sizes reported for UWR spring chinook since 1970 have ranged from 30,000 to 130,000, with the 2000-2002 runs in the range of 60,000 to 120,000. In 2002, fishery counts at the Willamette Falls fishway showed a rate of 77% for marked fish through June. Hence, approximately 23% of the 2002 estimated run size of 121,700, or approximately 28,000 returning adults, were natural spawners in the Willamette basin (ODFW 2003). Marking of hatchery releases with an adipose fin clip reached 100%, beginning with those released in 1998 (S. King, ODFW, personal communication with A. Mullan, NOAA Fisheries, 28 October 2002, email).

Fish in this ESU are distinct from those of adjacent ESUs in life history and marine distribution. The life history of chinook salmon in the UWR ESU includes traits from both ocean- and stream-type development strategies. Coded wire tag recoveries indicate that the fish travel to the marine waters off British Columbia and Alaska. More Willamette River fish are recovered in Alaskan waters than fish from the Lower Columbia River ESU. UWR chinook salmon mature in their fourth or fifth years. Historically, 5-year-old fish dominated the spawning migration runs, but recently, most fish have matured at age 4. The timing of the spawning migration is limited by Willamette Falls. High flows in the spring allow access to the upper Willamette basin, whereas low flows in the summer and autumn prevent later-migrating fish from ascending the falls. The low flows serve as an isolating mechanism, separating this ESU from others nearby.

Hatchery production in the basin began in the late nineteenth century. Eggs were transported throughout the basin, resulting in current populations that are relatively homogeneous genetically, although still distinct from those of surrounding ESUs. Hatchery production continues in the Willamette River, with an average of 8.4 million smolts and fingerlings released each year into the main river or its tributaries between 1975 and 1994. Hatcheries are currently responsible for 90% of escapement in the basin.

Harvest on this ESU is high, both in the ocean and in river. The total in river harvest below the falls from 1991 through 1995 averaged 33%, and was much higher before 1991. Ocean harvest was estimated as between 19-33% since 1982. ODFW (1998) indicates that total marine and freshwater harvest rates on UWR spring-run stocks were reduced considerably for the 1991 through 1993 brood years, to an average of 21%. Before full marking of hatchery fish with an adipose fin clip, harvest occurred on both wild and hatchery fish. Present regulations allow only marked fish to be retained.

In 2003, the BRT found that, except for the Clackamas population, spring chinook in this ESU must pass Willamette Falls, and thence some portion of the proposed action area, when migrating to or from spawning areas. The BRT reviewed data of historical spring chinook populations including: Clackamas, Mollala, North Santiam, South Santiam, Calapooia, McKenzie, and Middle Fork Willamette Rivers. While lacking an assessment of the ratio of hatchery-origin to wild-origin chinook passing the falls, hatchery-origin fish were described as dominating the runs. Hatchery spring chinook are released in the Upper Willamette River as mitigation for the loss of habitat above Federal dams. While harvest retention is only allowed for hatchery marked fish, take of natural spawners from hooking mortality and non-compliance also occurs. Overall, the hatchery production is considered a potential risk because it masks the productivity of natural population, interbreeding between hatchery and natural fish poses potential genetic risks, and incidental take from the fishery promoted by the hatchery production can increase adult mortality.

The BRT concluded that the only sub-population of UWR spring chinook considered self-sustaining is the McKenzie, yet its abundance has been relatively low (thousands) with a substantial input from hatchery populations. Substantial increases seen in the last couple of years were hypothesized to be a result of increased ocean survival. Since it is unknown what ocean survival will be in the future, the long-term sustainability of this population is uncertain.

Present to historical habitat ratios[2] for individual tributaries were reported to be from 46% on the Middle Fork Willamette to 74% on the McKenzie. Hatchery fractions were reported in the range of 26% on the McKenzie to 97% on the North Santiam (BRT 2003, Table A.2.6.1). For the UWR chinook salmon ESU as a whole, NOAA Fisheries estimated that the median population growth rate (lambda) over the base period ranges from 1.01 to 0.63, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (Tables B-2a and B-2b in McClure *et al.* 2000).

Upper Willamette River Steelhead

The UWR steelhead ESU occupies the Willamette River and tributaries upstream of Willamette Falls, extending to and including the Calapooia River. These major river basins containing spawning and rearing habitat comprise more than 12,000 km^2 in Oregon. Rivers that contain naturally-spawning, winter-run steelhead include the Tualatin, Molalla, Santiam, Calapooia, Yamhill, Rickreall, Luckiamute, and Mary's Rivers. Early migrating winter and summer steelhead have been introduced into the upper Willamette basin, but those components are not part of the ESU. Willamette Falls (river mile 26) is a known migration barrier and while winter steelhead and spring chinook salmon historically occurred above the falls, summer steelhead, fall chinook, and coho salmon did not. Native winter steelhead within this ESU have been declining since 1971, and have exhibited large fluctuations in abundance. Habitat in this ESU has become substantially simplified since the 1800's by removal of large woody debris to increase the river's navigability, by reduction in riparian vegetation, and by channel modifications.

In general, native steelhead of the upper Willamette basin are primarily late-migrating winter steelhead, entering freshwater primarily in March and April. This atypical run timing appears to be an adaptation for ascending Willamette Falls, which functions as an isolating mechanism for UWR steelhead. Reproductive isolation resulting from the falls may explain the genetic distinction between steelhead from the upper Willamette basin and those in the lower river. UWR late-migrating steelhead are ocean-maturing fish. Most return at age four, with a small proportion returning as 5-year-olds (Busby *et al.* 1996).

Spawning takes place from April through the first of June, similar to historical conditions. Because spawning takes place primarily in May, it is separated in time from that of UWR chinook salmon which takes place primarily in September. Some spatial separation also occurs because UWR steelhead typically spawn in smaller streams than UWR chinook salmon.

The West Coast steelhead BRT met in January, 2003, to determine if new information or data warranted any modification of the conclusions of the original BRTs. They focused primarily on information for anadromous populations in the risk assessments for steelhead ESUs, but considered the presence of relatively numerous, native resident fish as a mitigating risk factor for some ESUs. Their draft report noted that after a decade in which Willamette Falls counts were near the lowest levels on record, adult returns for 2001 and 2002 were up significantly. Yet the total abundance is small for the entire ESU with a recent mean of less than 6,000, with many

[2]The present to historical habitat ratio is the percent of the historical habitat that is currently available.

populations at relatively low levels. Most of the populations are in decline over the period of the available time series (BRT 2003). Given that the BRT could not conclusively identify a single naturally self-sustaining population, it is uncertain whether recent increases can be sustained. The discontinuation of the releases of the "early" winter-run hatchery population was described as positive, but continued releases of non-native summer steelhead are a cause for concern. Available time series are confounded by the presence of hatchery-origin spawners.

For the UWR steelhead ESU as a whole, NOAA Fisheries estimated that the median population growth rate (lambda) over the base period ranges from 0.94 to 0.87, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (Tables B-2a and B-2b in McClure *et al.* 2000).

2.1.2. Evaluating Proposed Actions

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 CFR Part 402 (the consultation regulations). NOAA Fisheries must determine whether the action is likely to jeopardize the listed species. In conducting analyses of habitat-altering actions under section 7 of the ESA, NOAA Fisheries uses the following steps: (1) Consider the status and biological requirements of the species; (2) evaluate the relevance of the environmental baseline in the action area to the species' current status; (3) determine the effects of the proposed or continuing action on the species; (4) consider cumulative effects; and (5) determine whether the proposed action, in light of the above factors, is likely to appreciably reduce the likelihood of species survival in the wild. In completing this step of the analysis, NOAA Fisheries determines whether the action under consultation, together with all cumulative effects when added to the environmental baseline, is likely to jeopardize the continued existence of the listed species. If NOAA Fisheries finds that the action is likely to jeopardize the listed species, NOAA Fisheries must identify reasonable and prudent alternatives for the action.

The environmental baseline is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species or its habitat and ecosystem within the action area. Direct effects occur at the project site and may extend upstream or downstream based on the potential for impairing fish passage, hydraulics, sediment and pollutant discharge, and the extent of riparian habitat modifications. Indirect effects may occur throughout the watershed where actions described in this Opinion lead to additional activities or affect ecological functions, contributing to habitat degradation.

2.1.2.1 Biological Requirements

The first step in the methods NOAA Fisheries uses for applying the ESA section 7(a)(2) to listed salmon is to define the species' biological requirements that are most relevant to each consultation. NOAA Fisheries also considers the current status of the listed species, taking into account population size, trends, distribution and genetic diversity.

The relevant biological requirements are those necessary for the subject species to survive and recover to a naturally-reproducing population level, at which time protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stock, enhance its capacity to adapt to various environmental conditions, and allow it to become self-sustaining in the natural environment.

For actions that affect freshwater habitat, NOAA Fisheries usually describes the habitat portion of a species' biological requirements in terms of a concept called properly functioning condition (PFC). PFC is defined as the sustained presence of natural, habitat-forming processes in a watershed that are necessary for the long-term survival of the species through the full range of environmental variation (NMFS 1999). PFC, then, constitutes the habitat component of a species' biological requirements. UWR steelhead and chinook salmon survival in the wild depends on the proper functioning of ecosystem processes, including habitat formation and maintenance. Restoring functional habitats depends largely on allowing natural processes to increase their ecological function, while at the same time removing adverse effects of current practices. For this consultation, the biological requirements are improved habitat characteristics that would function to support successful adult migration and juvenile over-winter rearing, and spring out-migration. The current status of the indicated fish species, based upon their risk of extinction, has not significantly improved since the species were listed.

Essential elements for salmonids are: Substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food (juvenile only), riparian vegetation, space, and safe passage conditions. Based on migratory and other life history timing, it is likely that both adult and juvenile life stages are present in the action area when activities would be carried out. Actions authorized by the proposed project may affect water quality, water temperature, water velocity, cover/shelter, food, riparian vegetation, and safe passage.

2.1.2.2 Environmental Baseline

Portland's Bureau of Environmental Services (2003) describes the Willamette River watershed as the largest river basin in Oregon, covering 11,500 square miles, bordered on the east by the Cascades and on the west by the Pacific coast ranges. They note that it is home to most of the state's human population, its largest cities, and many major industries. The watershed also contains some of Oregon's most productive agricultural lands and supports important fishery resources. Agricultural land comprises 22% of the watershed and is concentrated in lowland areas, and more than 70% of the watershed remains forested primarily in the upper tributary reaches. Urban uses make up the remainder of the land area.

The Willamette River, once a highly braided river system, has been dramatically simplified through channelization, dredging, and other activities that have reduced rearing habitat by as much as 75%. In addition, the construction of 37 dams in the basin has blocked access to more than 700 kilometers (km) of stream and river spawning habitat. The 13 major reservoirs can store 1.88 million acre-feet and are operated for flood protection, power generation, navigation, irrigation, recreation, water supply, fish and wildlife conservation, and pollution abatement

(Uhrich and Wentz 1999). The dams alter the temperature regime of the Willamette and its tributaries, affecting the timing and development of naturally-spawned eggs and fry. Water quality is also affected by development and other economic activities. Agricultural and urban land uses on the valley floor and timber harvesting in the Cascade and Coast ranges contribute to increased erosion and sediment load in Willamette River Basin streams and rivers. Municipal and industrial pollution has been present in the lower Willamette River since the 1920's.

Channel Changes

The mainstem Willamette River was altered by channelization for early navigation and by large wood removal. Extensive agricultural and urban development reduced the riparian forest from the 1870s to the present (Sedell and Frogatt 1984). Early descriptions of the river mentioned dense woodland covering the floodplain, maintained by annual fires set by Indians, and constant formation of islands and bars in the river (Sedell and Frogatt 1984).

Gregory *et al.* (2002b) calculated that the total Willamette River channel area decreased from 41,000 to 23,000 acres between 1850 and 1995. They noted that from Newberg (RM 50) to the mouth the river is confined within a basaltic trench, and that due to this geomorphic constraint, the loss in channel area was less than the upstream areas. In this lower river, among reach types, side channels showed an 80% loss in area, while alcove areas increased 54%. Smaller losses of 5% in primary channel and 3% in island areas also occurred. Less dynamic than other reaches of the river, the lower reach also lacks extensive floodplains reducing the potential refuge for aquatic communities during major flood events (Gregory *et al.* 2002b). While the total channel area remained constant, changes in depth from ongoing extraction activities further reduced the available refugia area (OWRRI 1995).

Upstream from Newberg to Albany (RM 118), the loss in channel area was described as variable and intermediate, with the river running through a series of basaltic outcrops and mountains within the floodplain. This reach included losses of 12% primary channel area, 16% side channels, 33% alcoves, and 9% islands. Overall, the length of channel types didn't change while the area did (Gregory *et al.* 2002b).

The Willamette Restoration Initiative (WRI 2001) noted that dams changed erosion processes in the Willamette by trapping sediment, some of which may have been replaced by increased erosion downstream of dams. Because of the ongoing concentration of flows into a single channel, the erosive power has increased, contributing to bank erosion and loss of riparian vegetation during flood events. The WRI also noted that changed in erosion processes have reduced channel complexity, and reduced the river’s capacity to support native fish, absorb the impacts of erosion and flooding, and filter contaminants (WRI 2001).

Revetments

The banks of the Willamette River have over 96 miles of revetments, approximately half constructed by the COE. Generally, the revetments were placed in the vicinity of roads or on the outside bank of river bends, so that while only 26% of the total length is revetted, 65% of the meander bends are revetted (Gregory *et al.* 2002c). However those downstream of Newberg were not constructed and are not operated by the Corps, as shown in the Willamette River Basin Planning Atlas (Gregory *et al.* 2002c). Of the 39 miles of revetments below Newberg, most are downstream of Willamette Falls. In the area above the falls, the east bank is entirely revetted in the vicinity of the Tualatin River confluence (RM 28) down to Willamette Falls, which is likely due to erosion concerns along the railroad and Highway 99 corridor. Upstream from the Tualatin, the revetments are also primarily along the east or south bank. Fewer revetments were placed on the opposite bank, and those are primarily at the Tualatin confluence and below the Interstate 5 bridge (RM 38.5). At Newberg (RM 50), it is primarily the northeast bank that is revetted. Ash Island (RM 51-52) has revetments on outside banks of both channels. Gregory *et al*. (2002c) note that the as the majority of dynamic sections have been armored.

<u>Sediment</u>
Changes to the hydrologic and sediment volume and composition followed the construction of 13 major dams on the tributaries between1941 and 1965. Comparing the sediment load pre- and post-reservoir construction in a research report, Laenen (1995) noted that post-reservoir samples were composed of finer material, with an increase in average suspended sediment finer than 62-micrometers from 62% to 85% for the Willamette River at Salem. He also estimated the percent of total sediment load as bedload for annual high flow exceedence probability of 50%, or 2-year events. Thus, Laenen calculated that 4% of the sediment load was bedload near the McKenzie confluence (RM 175), but 18% was bedload at Harrisburg (RM 161). He noted that annual sediment loads are likely to have decreased along with the reduced peak streamflows post-reservoir and dam construction. These lower peak flows prevent meandering, bank undercutting, and deposition of materials mid-river, leaving a 'single thread' river with few islands or off-channel areas (Andrus *et al.* 2000). This also limits the variability in substrate size in the main channel, which reduces spawning and rearing opportunities.

<u>Sand and Gravel Mining</u>
In the State of Oregon, permitted gravel removal has increased steadily between 1967 and 1994. Commercial instream gravel removal was estimated to be 100 million cubic yards (cy) during these years, with approximately 40 million cy coming from the Willamette River (OWRRI 1995a and 1995b). Complete information is not available on the actual amount of gravel and other aggregates removed by instream mining operations because no one monitors the actual amount removed (IMST 2002).

In the area proposed for mining between river miles 27 and 56.5, mining for sand and gravel has taken place since at least 1958. Records provided as part of the consultation show total volumes and tons from 1958 to 2001. The total annual volume ranged from lows of 10,000 to 70,000 cy annually up to 1967, expanding considerably to 170,000 to 380,000 cy annually in the same reach over the period of 1968-2000 (JBT 2000). The total removed over the entire period was close to 9 million cy. Other operators permitted in the mainstem Willamette River by the COE since 1996 have proposed maximum annual quantities of 325,000 cy, of which 140,000 cy was in the area proposed for mining (COE Public Notice 1996-430). The total volume mined in the mainstem and tributaries without COE permits is unknown.

When bedload is deposited upstream in areas that have already been mined for gravel and when it is trapped behind dams, the water velocity does not decrease so sediment-starved water aggressively scours banks and bars downstream (IMST 2002). River depths decline as the streambed degrades from reduced sediment. Klingeman (1973) used approximately 20 years of water stage data from four mainstem sites in the Willamette River to estimate that the average rate of degradation was one foot per 10 years over a wide range of discharges. He noted that the data were insufficient at that time to view dams and reservoirs as a major contributor to the lowering of water stage height measured for different flow levels at gaging stations along the mainstem. The sand and gravel mining in the channel is described as one plausible explanation for observed gage changes. Because removal of sediment would be expected to result in sediment transport regime adjustment in the vicinity, and is likely to be accompanied by bank and bed scour, he suggested further investigation into local effects. Klingeman estimated that this rate of channel degradation in the Willamette River is consistent with loss of far less material that was historically removed by gravel mining. Finally, noting that many bank revetments might force the river to cut in an upstream direction to dissipate excess energy otherwise attributable to erosion, he suggested that this could also account for some of the downward trend in gaging curves. Increased rates and amounts of runoff from urbanization are also described as potential causes for specific gage changes, since these magnify any bed-cutting that would otherwise be less noticeable.

Vegetation

Overall, riparian forests have diminished considerably in the lower reaches of the Willamette River (Gregory *et al.* 2002d). Sedell and Frogatt (1984) noted that agriculture and cutting of streamside trees were major agents of change for the riparian vegetation, along with snagging of large wood in the channel, although no specific data are available on the cutting of the floodplain forest. They also say that the reduced shoreline, fewer and smaller snags, and reduced riparian forest represent large functional losses to the river, reducing structural features, organic inputs from litter fall, entrained allochthonous materials and flood flow filtering capacity. These changes were in place primarily before the major dams were built, as the navigational and agricultural demands had dominated the early use of the river. The once expansive forests of the Willamette River floodplain supplied valuable nutrients and organic matter during flood pulses, provided a food source for macroinvertebrates, and provided slow-water refugia for fish during flood events. These forests also cooled river temperatures as the river flowed through its many channels.

Gregory *et al.* (2002d) described the changes in riparian vegetation in river reaches from the mouth to Newberg, from Newberg to Albany, and from Albany to Eugene. They noted that the riparian forests formerly were a mosaic of brush, marsh, and ash openings maintained by annual flood inundation. Below Newberg the most noticeable change from was that conifers were almost eliminated. Above Newberg, the formerly hardwood-dominated riparian forests along with mixed forest made up less than half of riparian vegetation by 1990 while agriculture dominated. This conversion represents a loss of recruitment of large woody debris (LWD), which functions as a component of channel complexity, much as the morphology of the streambed does, to reduce velocity and provide habitat for invertebrates that supports the salmonid prey food base. Declining extent and quality of riparian forests have reduced rearing and refugia habitat for juveniles provided by large wood, reduced the extent to which shading by riparian vegetation can cool water temperatures, and reduced the availability of leaf litter input into the system and the macroinvertebrates that feed upon it.

Water quality

The reach of the Willamette River within the action area is listed by ODEQ for mercury, bacteria, and summer temperature (ODEQ 2002). In the reach between RM 26 and 55, described as the Newberg Pool, Markle *et al.* (2002) found high rates of skeletal abnormalities and noted that in northern pikeminnow samples from 1983 and 2000, the deformity loads were greater than those of samples upstream at Wheatland Ferry (RM 72). Their study results suggested maternal transfer or acute toxicity early in development could explain the skeletal deformities because there was an inverse correlation with position in the food web. Chiselmouth, which scrape algae and diatoms from bottom substrates, showed the highest deformity loads among native species, yet carnivorous smallmouth bass had only 25% as many deformities. Thus, bioaccumulation was not a likely cause of these deformities.

2.1.3 Analysis of Effects

2.1.3.1 Effects of the Proposed Actions

The proposed action consists of excavating sand and gravel from the river channel using a clamshell dredge. The dredge will be operated from a barge that will be moved between mining areas where it will be anchored to the streambed with spuds (short, steel beams). Actions interrelated and interdependent with the proposed action include transferring the sand and gravel to a transport barge, moving the sand and gravel to the upland processing area near Wilsonville, at RM 39, then processing the material for sale and off-site use. Together, these actions will produce a sequence of direct effects that will occur immediately at the project site and across a much larger upstream and downstream area. The most important direct effects will be water quality degradation and channel modification. Indirect effects are defined in 50 CFR 402.02 as "those that are caused by the proposed action and are later in time, but still are reasonably certain to occur." These actions will also cause indirect effects, primarily altered riparian vegetation and floodplain degradation. These effects will be reduced by conservation measures the applicant proposed to follow until the operation ends in 2008.

The effects analysis presented in this section is based on information in the BA and supplementary material, and the effects summarized in NMFS (1996) and NOAA Fisheries (2003). Each of these documents were developed using a combination of analyses of existing data and best professional scientific judgement. Together with the literature cited therein, they provide a comprehensive review of the effects of instream gravel mining on habitat conditions necessary to sustain all life stages of anadromous fish and aquatic habitats.

Water Quality Degradation

Pollution Effects

Operation of the excavator and processing equipment requires the use of fuel, lubricants, and other petroleum products, which, if spilled into the bed or channel or into the riparian zone of a waterbody during construction could injure or kill aquatic organisms. Dredging and excavation activities have the potential to resuspended bedded contaminants or unearth buried contaminants adhered to sediment and soil particles. Discharge of barge water during transit can carry sediments and a variety of contaminants to the riparian area and stream. Once delivered into the waterbody, those contaminants act a new sources to benthic invertebrates and fish. The suspended, contaminated particles can resettle onto a new site, affecting a previously undisturbed benthic population, or be taken up directly or indirectly by fish. Upland contained areas can also produce runoff if washing is done on site. However, as required in the permit proposed for a one-time renewal, the operation will not allow petroleum products, chemicals, or other deleterious materials to enter the water, nor will waste waters from the operations be returned to the river. To ensure that spills will be prevented, a pollution and erosion control plan will be prepared and carried out. Erosion control elements of the plan will address materials storage sites, access roads, haul roads, and inspection and replacement of erosion controls.

Turbidity Effects

The direct physical and chemical effects of dredging and spoil disposal activities can include modification of bottom topography and water circulation patterns, increased turbidity, a shift to coarser substrate within the dredged area, bottom siltation outside the dredged area with fine sediments, and return water from upland spoil disposal areas (Darnell 1976, NMFS 2002). Instream gravel mining, including transport by barge, creates a turbidity plume with effects on migrating and rearing fish.

The clamshell digging disturbs the armor layer, and releases sediment as the bucket travels through the water column to the barge surface. Suspended material will redistribute and settle to the bottom, reducing the particle size of surface sediments. Sediment may scour, smother or bury primary producers (diatoms, aquatic vegetation) and consumers (epibenthic organisms) reducing their availability as food. Turbidity will reduce light penetration and interfere with photosynthetic production of oxygen. Extraction in wet stream channels suspends fine sediment during times of the year when concentrations are normally low and the river is less able to assimilate suspended sediment (Weigand 1991).

Collins and Dunne (1990) noted that scoured bed gravels expose underlying substrates, and that pool-riffle structures are destroyed, leaving unsuitable fish habitat. Finer sediment is released, leading to increases in suspended sediment. The modified morphology and reduced overall sediment supply propagate the habitat effects beyond the immediate extraction area. Because sediment 'armors' the bed and stabilizes banks and bars, removing this armor layer causes excessive scour and sediment movement after the mining operation (Lagasse *et al.* 1980; OWRRI, 1995). The more easily transported particles which are eroded by the 'sediment-starved' water can increase both the background turbidity level and the embeddedness of downstream substrate, while coarsening the scoured areas (Kondolf 1993, Dietrich 1989). Given the low gradient, pool-like structure of the reach below Newberg, sediments disturbed by mining activities are likely to settle until resuspended.

At moderate levels, turbidity can adversely affect primary and secondary productivity. At high levels, turbidity can injure and kill adult and juvenile fish. Turbidity might also interfere with feeding (Spence *et al.* 1996). Behavioral effects on fish, such as gill flaring and feeding changes, have been observed in response to pulses of suspended sediment (Berg and Northcote 1985). Local increases of turbidity during in-water work will likely displace fish in the project area and disrupt normal behavior.

Exposure duration is a critical determinant of the occurrence and magnitude of physical or behavioral turbidity effects (Newcombe and MacDonald 1991, Newcombe and Jensen 1996). Salmonids have evolved in systems that periodically experience short-term pulses (days to weeks) of high suspended sediment loads, often associated with flood events, and are adapted to such seasonal high pulse exposures. Adult and larger juvenile salmonids appear to be little affected by the high concentrations of suspended sediments that occur during storm and snowmelt runoff episodes (Bjornn and Reiser 1991). However, research indicates that chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Redding *et al.* 1987, Lloyd 1987, Servizi and Martens 1991). In a meta-analysis and review of 80 published reports of fish responses to suspended sediment in streams and estuaries, Newcombe and Jensen (1996) documented increasing severity of ill effects with increases in dose (concentration x exposure duration). They used the results to model empirical log-linear equations for different life history stages of salmonids to predict severity of ill effects from exposure concentration and duration. For events between extremes of no effect and 100% mortality, they scored qualitative response data with a semi-quantitative ranking scale of severity ranging from 1 - 3 for behavioral, through sublethal (4 - 8) and up to lethal and paralethal when reduced growth rates or mortality occurred (9 - 14). One model for juvenile and adult salmonids exposed to sediments from fine to coarse size, provided the following equation:

(1) $\text{Severity} = 1.0642 + .6068 * \log_e(\text{time}) + .7384 * \log_e(\text{concentration})$

where time is in hours and concentration is measured in milligrams of suspended solids per liter (mg SS/L). This would result a range of severity values with either increasing time or increasing concentration, such as shown for these values:

Duration (hours)	**Concentration (mg SS/ L)**	**Severity**	**Effects description**
1	88	2	alarm reaction
12	54	5.5	Minor physiological stress (increased coughing or respiration)
36	9400	10.0	0 -20% mortality
96	488	8.4	Major physiological stress (reduced feeding rate or success)

Elevated total suspended solids (TSS) conditions were reported to cause physiological stress, reduce growth, and adversely affect survival. Of key importance in considering the detrimental effects of TSS on fish are the season, frequency and the duration of the exposure. Behavioral avoidance of turbid waters may be one of the most important effects of suspended sediments (Scannell 1988). Salmonids have been observed to move laterally and downstream to avoid turbid plumes (Scannell 1988, Servizi and Martens 1991).

Fish that remain in turbid, or elevated TSS, waters can experience a reduction in predation from piscivorous fish and birds (Gregory and Levings 1998). In systems with intense predation pressure, this provides a beneficial trade-off as enhanced survival at the cost of potential physical effects, like reduced growth. Turbidity levels of about 23 Nephalometric Turbidity Units (NTU) have been found to minimize bird and fish predation risks (Gregory 1993).

Rivier and Seguier (1985) examined extraction of alluvial material form river beds, and noted the increase in fines silting up the channel, as well as related erosive suspension of sediment, with effects on fish breathing mechanisms and increased abrasions leading to penetration of pathogenic agents at high concentrations of suspended sediments.

Macroinvertebrate and Feeding Behavior Effects

Interstitial spaces provide habitat for the invertebrate communities that are a major food source for all age classes of salmon. Most invertebrate production occurs in riffle habitat comprised of rubble and coarse gravel materials. Macroinvertebrates move, rest, find shelter, and feed on the substrate, and its stability is affected by changes in size, sorting, roundness, and shape (Rice *et al.* 2001). Spatial variations in bed material are reflected by macroinvertebrate responses at various scales.

The highest abundance of invertebrates is produced by well-graded mixtures of gravel and cobble, with poorly-graded mixtures of sands and silts, or boulders and bedrock, producing the lowest abundance (Reiser 1998). In particular, the significant taxonomic groups for salmonid food sources, including orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichopetera (caddisflies), collectively designated EPT organisms, show preferences for small to large-sized gravels rather than coarse or fine sands. Reiser (1998) described studies which showed an association between stonefly abundance and the volume of interstitial space, suggesting excessive deposition of fine sediments can reduce pore space and result in less invertebrate production. Sediment intrusion into interstitial spaces decreases the habitable areas for EPT species (Bjornn *et al.* 1977). Reduced food sources, particularly when combined with higher temperatures, will result in decreased growth rates or reduced survival (Brett *et al.* 1982, Rich 1987), as fish need higher food intakes to maintain homeostasis at higher temperatures due to reduced conversion efficiencies (Smith and Li 1983).

Brown *et al.* (1998) sampled within an instream gravel mining project, and upstream and downstream, and observed significant alterations in all components of biotic communities, biomass, invertebrates, and fish. The biomass and density of small invertebrates and density of large invertebrates were reduced at smaller, frequently mined sites, and density of fish in pools were reduced at large mines. Brown *et al.* (1998) suggested that the alteration of normal riffle-pool morphology, flow patterns, and fine sediment transport explained the communities' response to the mining disturbance. Rivier and Seguier (1985) found that not only was biomass of benthic invertebrates found to decrease downstream, but the groups represented shifted from the EPT organisms to those suitable to finer material in the substrate, such as Chironomids and Oligochaetes. With macroinvertebrate habitat reduced by fines deposited in interstitial spaces during and after mining and by increased bed depth, macroinvertebrate food sources are reduced, and lower growth rates would be expected. An accompanying reduction or elimination of food, or a change in invertebrate prey species may displace UWR salmon and steelhead from rearing habitat. Decreases in growth and consequent decreases in smolt size will result in decreased smolt to adult survival.

Channel Modification

<u>Altered Sediment Transport Balance</u>
While no sediment budget exists for the Willamette Basin, mining upstream of this area, revetments, and the reservoirs for the Willamette Project all contribute to the lack of sediment, making it likely that removal in excess of inputs has taken place for decades as volumes mined increased while replacement sources were concurrently reduced. It is uncertain how the geormorphic constraint of the basaltic intrusion downstream at Willamette Falls affects the erosion capability of the sediment starved flows at this point. The channel is prevented from downstream lengthening, so one possibility is that the river has been forced to cut the bed in an upstream direction to dissipate excess energy from mined reaches where bank protection is already in place (Klingeman 1973). The bed degradation from reduced sediment load can eliminate the complex bedforms which provide salmon refugia in high velocity flows. The deepened mining areas represent a loss of productive shallow water habitat where photosynthetic activity forms the base of the food web for rearing juvenile salmon. Side channel habitat, already greatly reduced in the action area (Gregory *et al.* 2002b), is dewatered by the incised channel or lost to erosion. Where headcutting spreads into a tributary, the incision increases flow velocities and may move gravel into mainstem. This increases the range of altered substrate, and may exacerbate the effects of ongoing gravel removal upstream in the tributaries.

Excavation of a pit in the river bed alters the relationship between sediment load and shear stress forces and increases bank and channel erosion. This not only disrupts channel form, it also disrupts the processes of channel formation and habitat development (Lagasse *et al.* 1980, Newport and Moyer 1974, Waters 1995). At the upstream end of the excavated pit, a knickpoint forms where higher velocity at the locally steeper gradient starts a 'headcut' that migrates upstream and may enter tributaries (Kondolf 1997, Kondolf *et al.* 2002). As the pit traps bedload sediment, the flows retain the capacity to transport sediment downstream but require a source of replacement sediment to establish a new equilibrium. These "hungry" flows lead to erosion and an incised streambed beyond the excavation area (Kondolf 1997, Kondolf *et al.* 2002).

At low flows, incised channels will reduce water surface elevations on the margins, replacing suitable pool-riffle habitat with shallower, warmer reaches. At high flows the complex streambed is replaced with trench-like extensions from the original pit, without the roughness elements to provide velocity refugia to upstream and downstream migrants. Pool-riffle complexes are modified, if not lost completely from reaches with extensive changes in channel profile. When the amount mined exceeds the recruitment levels, the dynamic formation of bars and islands is reduced by the lack of material. Channel erosion can destabilize banks when they are the source of 'replenishment' for the missing bedload material. A common response has been to add revetments in eroding reaches which reduces the suitable habitat by hardening and channelizing the limited remaining area of the channel migration zone.

Erosion in areas upstream and downstream of mined reaches, including tributaries where headcuts migrate from the mainstem, will likely result in further revetment. Both the COE and private entities have constructed revetments along the Willamette River to protect property from the erosive powers of the river. Combined, 25% of the Willamette River is revetted on one or both sides. However, channel change usually occurs along river bends and near side channels, and approximately 65% of all meander bends along the mainstem Willamette are revetted, stabilizing the most dynamic sections of the river (Gregory *et al.* 2002c). Revetments in the lower reaches primarily protect urban areas. Revetments on the middle river protect agricultural, forested, and urban land in approximately equal proportions (Gregory *et al.* 2002c).

The loss of islands, alcoves and side channel areas, combined with extensive revetments, has limited hyporheic connectivity within the Willamette River. Hyporheic connectivity is dependent on fresh, unconsolidated gravel. Revetments directly prevent connectivity by hindering migration of the channel that is necessary for loose gravel to deposit and create conditions conducive to hyporheic flow (Fernald *et al.* 2001). The loss of extensive hyporheic networks further degrades the quality of off-channel rearing habitat because high temperatures in the main channel and in alcoves of the Willamette limit use of these habitats by juveniles in the summer. When gravel removal such as is proposed leads to erosion, increased revetments, and reduced gravel sources, hyporheic connectivity is impeded and the already limited habitat may be further degraded and reduced.

<u>Riparian Vegetation Effects</u>

The magnitude and frequency of peak flows in the Willamette River mainstem have been dramatically reduced by operation of the flood control reservoirs, and reducing channel length. The combined effects of increased coarse sediment storage in reservoirs and reduced peak flows that once provided floodplain connectivity is exacerbated by mining, leading to incised channels. Lack of floodplain connectivity also causes reduced nutrient exchange, reduced sediment exchange, reduced flood refugia for fish, and reduced establishment of new riparian vegetation.

As riparian forests along the Willamette mature, the biomass of snags and downed wood increases (Fierke 2002), which serves as a source of large wood that can be recruited into the river through channel migration or over bank flooding. Wood in the mainstem Willamette River must be large to significantly affect local hydraulics and channel-forming processes (Abbe and Montgomery 1996). Without continued establishment of young cottonwood forests, the floodplain cannot continue to produce wood of this type.

The reduction of vegetation associated with erosion and with incised channels reducing flows to riparian areas and side channels can change their characteristics in ways which adversely affects fish. Vegetation in riparian areas influences channel processes by stabilizing bank lines through root reinforcement, providing and retaining large woody debris (LWD), providing organic material inputs, such as leaf litter, terrestrial organisms that are preyed upon by fish, and providing shade that regulates light and temperature regimes (Kondolf *et al.* 1996, Gregory *et al.* 1991). In addition, riparian vegetation and LWD can provide low velocity shelter habitat for fish during periods of flooding. Instream LWD provides similar habitat at all flow levels, shelter from predators, habitat for prey species, and sediment storage and channel stability attributes (Spence *et al.* 1996). Removal of LWD during mining activities reduces the instream supply.

Vegetation provides root structure, which consolidates the substrate material and encourages channel stability that resists erosion forces (Beschta 1991). By strengthening the form of gravel bars, vegetation enhances the frictional resistance of the bar that acts to dissipate hydraulic energy (Kondolf 1997). This decreases the effective channel gradient, moderates flow velocities, and prevents undue erosion downstream. Riparian vegetation acts to remove suspended bedload material in the low velocity zones by increasing the hydraulic boundary layer (Beschta 1991). Removal of the vegetation, or prevention of its establishment, further reduces the capacity of the river channel to store fine sediment.

2.1.3.2 Cumulative Effects

Cumulative effects are defined in 50 CFR 402.02 as "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." Other activities within the watershed have the potential to impact fish and habitat within the action area. Future Federal actions, including the ongoing operation of hydropower systems, hatcheries, fisheries, and land management activities are being (or have been) reviewed through separate section 7 consultation processes.

Non-federal activities within the action area are expected to increase with a projected 34% increase in human population over the next 25 years in Oregon (Oregon Department of Administrative Services 1999). Thus, NOAA Fisheries assumes that future private and State actions will continue within the action area, but at increasingly higher levels as population density climbs. In some cases, this will result in higher density population areas, which could lower the per capita demand for aggregate products (Whelan 1995). In other cases, increased sprawl could increase demand for such products. While some of this will come from the DSL permitted mining in tributaries, possibly lacking COE jurisdiction, the adverse effects will continue to hinder the recovery of habitat and populations.

Floodplain aggregate sources may have the potential for side channel habitat restoration but with potential risks of avulsion, as was noted in the 1996 NOAA gravel policy paper. Floodplain mining also removes riparian vegetation and stockpiles overburden in the floodplain which can alter channel hydraulics during high flows. To avoid these effects, the gravel extraction sites should be situated outside the active floodplain and the gravel should not be excavated from below the water table.

2.1.3.3 Integration and Synthesis of Effects

The cumulative effects of changes in sediment supply in the Willamette basin take place at the watershed scale, where mining, reservoirs and flow regulation, levees and bank protection, and channel area reduction all combine to reduce gravel recruitment. Gravel extraction operations conducted by clamshell digging in the bed of the river modify the morphology of the river bed with consequent effects on habitat availability. Both during and after the excavation period, suspended sediment levels lead to increased turbidity, affecting the euphotic zone and the food web. Additional indirect effects arise from modifications to sediment transport and to the riparian zone. Biological effects include reduction or loss of rearing and migratory habitat, loss of prey from removal and silting in of shallow water habitat, and stress to migrating and rearing salmonids from the elevated suspended sediment levels.

Young salmon are generally able to avoid adverse habitat conditions if those conditions are limited to areas that are small compared with the total habitat area, and if ecosystem functions are restored before the next disturbance. Thus, juvenile salmon compensate for the short-term effects of adding fine sediment the channel or the temporary loss of productive shallow-water habitats by displacing themselves to similar habitats nearby. Those juveniles may pay an energetic price, including reduced food necessary for growth and maintenance, but they continue to survive in the system. Use of an in-water work period is an important conservation measure to limit contact between listed species and in-water disturbance. However, the benefits of an in-water work period are significantly reduced if the disturbance caused by the action is repeated annually throughout the entire in-water work period. The proposed gravel mining would occur throughout the in-water work period until phase out, but will move between areas each year (Table 1). Periods of recovery between disturbances will be possible in those areas without repeated mining, and will be extended by the phaseout to allow further recovery over the following decades.

With reduced mining volumes, and as operations phase out over 2003-2006, the overall effects of the proposed action will be reduced. As the total mined area is removed from production, channel recovery can begin. During the interim period, the following conservation measures will minimize biological effects:

1. Shallow water areas and thalweg depth will not be deepened.
2. The dredge barge will be maintained in a water tight condition and wash water will be pumped to an appropriate settling facility to ensure turbidity does not increase by more than 10% above background 100 feet below the discharge.
3. The clamshell will be equipped with an enclosed bucked to reduce resuspension of sediment.
4. In mined reaches, side slopes of 4 horizontal to 1 vertical, and offsets of 100 foot from the bank toes to reduce erosion and floodplain disconnection will be maintained.

5. Mining volumes will be reduced annually, and cross-sections of areas proposed will be reported prior to mining.
6. Mining in areas within one-half mile of tributary confluences will be avoided.
7. Restoration activities will take place concurrently with mining.
8. The mining will be phased out some areas immediately and the remaining over four years.

At the population level, the effects of the environment are understood to be the integrated response of individual organisms to environmental change. Thus, instantaneous measures of population characteristics, such as population abundance, population spatial structure and population diversity, are the sums of individual characteristics within a particular area, while measures of population change, such as a population growth rate, are measured as the productivity of individuals over the entire life cycle (McElhany *et al.* 2000). Lethal take of juvenile salmon associated with the proposed gravel extraction is expected to be minor and likely too insignificant to influence population abundance. However, year-round reductions in juvenile population density in the action areas will last until functional habitat recovery occurs, far longer than the gravel mining itself.

The time necessary for recovery of functional habitat attributes will vary by attribute. Recovery mechanisms such as riparian succession may develop quickly (months, years) if undisturbed by the further actions. However, recovery of functions related to channel morphology harmed by gravel mining is likely to require far longer (decades, centuries) and cannot begin until after the mining ends. Functions related to shading of the riparian area and stream, root strength for bank stabilization, and organic matter production will require intermediate lengths of time. Thus, habitat recovery following the proposed gravel mining that includes all important functional habitat attributes is likely to require longer than the 100-year period used to evaluate the role of local environmental variation in the long-term survival of salmon populations (McElhaney *et al.* 2000). The nature and extent of continuing land uses on surrounding private lands, and the expectation of further population growth, reduce ecosystem resilience and will likely extend the time necessary for these aquatic habitats to recover a natural and productive equilibrium even further.

A persistent change in the environmental conditions or resources of an ecosystem can lead to a change in the abundance of many, if not all, populations in the ecosystem and lead to development of a new community. Differences in riparian and instream habitat quality can alter trophic and competitive relationships in ways that support or weaken the populations of salmon and steelhead in relation to other more pollution tolerant species (Wentz et al. 1998; Williamson et al. 1998). However, with due diligence for the full range of proposed conservation outlined above, it is unlikely that physical and chemical changes due to activities associated with the proposed action will cause a persistent change in the conditions or resources available relative to the total habitat area after the phaseout. Thus, it is unlikely that the indirect biological effects of mining associated with the proposed action will affect the characteristics of individuals and populations at the biological community level.

2.1.5 Conclusion

The final step in NOAA Fisheries' approach to determine jeopardy is to determine whether the proposed action is likely to appreciably reduce the likelihood of species survival or recovery in the wild. NOAA Fisheries has determined that, when the effects of the proposed Bernert Gravel Mining addressed in this Opinion are added to the environmental baseline and cumulative effects occurring in the action area, it is not likely to jeopardize the continued existence of UWR steelhead and chinook salmon. NOAA Fisheries used the best available scientific and commercial data to apply its jeopardy analysis when analyzing the effects of the proposed action on the biological requirements of the species relative to the environmental baseline, together with cumulative effects.

These conclusions are based on the following considerations: (1) The applicant will phase out the mining operations over the four years of the permit; (2) the interim operations will reduce volumes and limit areas and depths mined to minimize the effects during the phase out; (3) turbidity from excavation and transport will be controlled by measures to maintain levels within 10% above natural background stream turbidity; (4) restoration activities will be proposed and implemented to compensate for some loss of habitat; and (5) the proposed phasing out of the river should allow long-term progress of impaired habitat toward proper functioning condition essential to the long-term survival and recovery at the population or ESU scale.

2.1.6 Conservation Recommendation

Section 7 (a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Conservation recommendations are discretionary measures suggested to minimize or avoid adverse effects of proposed actions on listed species, to minimize or avoid adverse modification of critical habitat, or to develop additional information. NOAA Fisheries believes the following conservation recommendations are consistent with these obligations, and therefore should be carried out by the COE:

1. Determine areas best suited for restoration activities to compensate for losses in functional habitat in the areas mined, following accepted examples of prioritization and selection factors (*e.g.*, Hulse *et al.* 2002).

2. Reduce permitted mining activities in areas of high quality rearing habitat, such as shallow water reaches, throughout the Willamette Basin.

3. Analyze sediment availability at the reach and basin level to determine recovery timelines of mined areas.

2.1.7 Reinitiation of Consultation

Reinitiation of consultation is required if: (1) The amount or extent of taking specified in the incidental take statement if exceeded; (2) the action is modified in a way that causes an effect on the listed species that was not considered in this Opinion; (3) new information or project monitoring reveals effects of the action that may affect the listed species in a way or to an extent not previously considered; or (4) a new species is listed or critical habitat is designated that may be affected by the action (50 CFR 402.16).

2.2 Incidental Take Statement

The ESA at section 9 [16 USC 1538] prohibits take of endangered species. The prohibition of take is extended to threatened anadromous salmonids by section 4(d) rule [50 CFR 223.203]. Take is defined by the statute as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." [16 USC 1532(19)] Harm is defined by regulation as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavior patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering." [50 CFR 222.102] Harass is defined as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering." [50 CFR 17.3] Incidental take is defined as "takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant." [50 CFR 402.02] The ESA at section 7(o)(2) removes the prohibition from any incidental taking that is in compliance with the terms and conditions specified in a section 7(b)(4) incidental take statement [16 USC 1536].

2.2.1 Amount and Extent of the Take

NOAA Fisheries anticipates that activities associated with gravel extraction called for by this proposed action are reasonably certain to result in incidental take of ESA-listed salmonids because of potential adverse effects from reduced channel complexity, increases in turbidity and erosion, losses of riparian vegetation, and reduced macroinvertebrate production.

UWR steelhead and spring chinook salmon may be adversely affected during the gravel extraction, and by ongoing habitat losses due to channel changes. Reduced areas and volumes mined will reduce effects, with recovery potential as the operation phases out and restoration activities are implemented. Therefore, even though NOAA Fisheries expects some level of incidental take to occur due to the action covered by this Opinion, the best scientific and commercial data available are not sufficient to enable NOAA Fisheries to estimate a specific amount of incidental take to the species itself. In instances such as this, NOAA Fisheries designates the expected level of take as unquantifiable. In the accompanying Opinion, NOAA Fisheries determined that this level of anticipated take is not likely to result in jeopardy to the species. The extent of the take is limited to UWR steelhead and chinook salmon in the

Willamette River and to the associated riparian and aquatic habitats in the action area as defined in section 1.3 of this Opinion.

2.2.2 Reasonable and Prudent Measures

The measures described below are non-discretionary. They must be implemented so that they become binding conditions in order for the exemption in section 7(a)(2) to apply. The Corps has the continuing duty to regulate the activities covered in this incidental take statement. If the Corps fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms added to the document authorizing this action, or fails to retain the oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

NOAA Fisheries believes that the following reasonable and prudent measures are necessary and appropriate to minimize the likelihood of take of listed fish resulting from implementation of this Opinion.

1. Minimize incidental take from barge operations by avoiding or minimizing disturbance to aquatic and riparian systems, and ensuring work is timed to avoid harming vulnerable salmonid life stages.

2. Minimize incidental take from instream gravel mining by avoiding or minimizing disturbance to aquatic and riparian systems.

3. Minimize incidental take from shoreline operations related to instream gravel mining by avoiding or minimizing disturbance to aquatic and riparian systems.

4. Ensure completion of a comprehensive monitoring and reporting program to confirm this Opinion is meeting its objective of minimizing take from permitted activities.

2.2.3 Terms and Conditions

1. To implement reasonable and prudent measure #1 (barge activities), the Corps shall ensure that all rock product barges and the clamshell dredge barge will be operated as follows to prevent leaks of sediment or sediment-laden water.

    a. All rock product barges and the clamshell dredge barge will be maintained in a water tight condition to prevent any material from returning to the waterway.
    b. Barge drainage and barge wash water will be pumped to an appropriate settling facility to ensure that return flows do not increases ambient stream turbidity by more than 10% above background 100 feet below the discharge, when measured relative to a control point immediately upstream of the discharge.

c. The clamshell will be equipped with an enclosed bucked that closes tightly to reduce resuspension of sediment throughout the water column.

d. Wash water return flows from the sand and gravel processing facility may not exceed do not exceed 4 feet per second at either the outfall or diffuser port, and the maximum size of any aperture may not exceed one inch.

e. Prepare and carry out a pollution and erosion control plan to prevent pollution caused by surveying or construction operations. The plan must be available for inspection on request by Corps or NOAA Fisheries, contain the elements listed below, and meet requirements of all applicable laws and regulations.

   i. The name and address of the party(s) responsible for accomplishment of the pollution and erosion control plan.

   ii. Practices to prevent erosion and sedimentation associated with barge and related shoreline operations, including access roads, stream crossings (if any), sand and gravel stockpile operations, construction sites, borrow pit operations, haul roads, equipment and material storage sites, fueling operations, staging areas, and roads being decommissioned.

   iii. Practices to confine, remove and dispose of sediments from any washout facilities.

   iv. A description of any regulated or hazardous products or materials that will be used for the project, including procedures for inventory, storage, handling, and monitoring.

   v. A spill containment and control plan with notification procedures, specific cleanup and disposal instructions for different products, quick response containment and cleanup measures that will be available on the site, proposed methods for disposal of spilled materials, and employee training for spill containment.

   vi. Practices to prevent materials or debris from dropping from the barge into any stream or waterbody.

2. To implement reasonable and prudent measure #2 (instream gravel mining), the Corps shall ensure that all instream gravel mining will be completed as follows to minimize disruption of normal fish behavior and degradation or destruction of aquatic habitats.

a. In-water work will be limited to June 1 - October 31, December 1 - January 31 (RM 27 to 50), and June 1 - September 30 (RM 50 to 55), when rearing and out migrating juvenile salmon are least likely to be present in the action area.

b. All dredge operations will take place within the following minimum setbacks, unless otherwise approved in writing by NOAA Fisheries.

   i. 150 feet from the shoreline

   ii. One-half mile from any tributary

c. Specific sediments to be dredged will have a pre-mining surface that is 20-feet or more below ordinary high water, and will result in a post-mining channel surface that is no deeper than the pre-mining thalweg (channel profile).

d. Post-mining side slopes will not exceed 4 feet horizontal to 1-foot vertical.

e. Annual mining volumes will not exceed estimates provided as shown in Table 1, nor will continued mining be permitted in the areas phased out.

3. To implement reasonable and prudent measure #3 (shoreline activities related to instream mining), the Corps shall ensure that all related shoreline operations, such as vehicle parking, fuel storage, administrative functions, storage of sand and gravel stockpiles, will be completed as follows to minimize degradation or destruction of riparian habitats.

   a. All related shoreline operations will be conducted 150 or more from ordinary high water, whenever feasible, to minimize degradation and destruction of riparian habitats.
   b. Prepare and carry out a compensatory mitigation plan to offset the long-term adverse effects of related shoreline operations within 150 of ordinary high water as follows.
      i. Base the level of mitigation on a functional assessment of adverse effects of the project, and functional replacement (*i.e.*, 'no net loss of function'), whenever feasible, or a minimum one-to-one linear foot or acreage replacement.
      ii. Acceptable mitigation includes reestablishment or rehabilitation of natural riparian vegetation or shallow-water habitats.
      iii. Include the following information.
         (1) The name and address of the party(s) responsible for meeting each component of the mitigation plan.
         (2) Performance standards for determining compliance.
         (3) Any other pertinent requirements such as financial assurances, real estate assurances, monitoring programs, and the provisions for short and long-term maintenance of the restoration or mitigation site.
         (4) A provision for Corps certification that all action necessary to carry out each component of the restoration or mitigation plan is completed, and that the performance standards are achieved.

4. To implement reasonable and prudent measure #4 (monitoring), the Corps shall ensure that:

   a. The applicant will complete the following monitoring activities to ensure that the proposed action is not causing an unacceptable level of take, and to provide information necessary to analyze alternatives to instream mining.
      i. <u>Implementation monitoring</u>. Ensure that the applicant measures and records the following implementation data.
         (1) Dates of any dredging activity
         (2) Daily GPS barge locations
         (3) Pre- and post dredging cross-sectional profiles

(4) Estimated depths of mining activities, sand and gravel volumes, and sediment size distribution
(5) A summary of turbidity monitoring reports
(6) A summary of pollution and erosion control inspections, including any erosion control failure, contaminant release, and correction effort.
(7) Photographs of habitat conditions at any mitigation site, before, during, and after project completion.[3] Label each photo with date, time, project name, photographer's name, and a comment about the subject.

ii. Effectiveness monitoring: In cooperation with ODFW, determine implementation of effectiveness data:
(1) Track changes in salmonid habitat in the vicinity of the extraction sites by noting the following characteristics:
(a) Riparian and instream habitat features
(b) Fish community structure
(c) Fish use
(d) Substrate composition
(2) Successful implementation of restoration projects.

b. Annual monitoring report. Ensure that the applicant submits an annual report to the Corps and to NOAA Fisheries, at the address below, by March 31st each year describing the results of annual implementation monitoring (including the current year pre-dredging profiles, estimated depths and volumes) and shoreline mitigation actions and any preliminary data or analyses completed regarding effectiveness monitoring.

Oregon State Director
Habitat Conservation Division
National Marine Fisheries Service
Attn: 2002/01097
525 NE Oregon Street
Portland, OR 97232

c. Final monitoring report. The final annual report that must be submitted on or before March 31st of the fifth year following the final year in which mining will be authorized under this Opinion must include the completed data and analyses of any effectiveness monitoring studies and a copy of the Corps' certification that all action necessary to carry out each component of the restoration or mitigation plan is completed, and that the performance standards were achieved.

[3] Relevant habitat conditions may include characteristics of channels, eroding and stable streambanks in the project area, riparian vegetation, water quality, flows at base, bankfull and over-bankfull stages, and other visually discernable environmental conditions at the project area, and upstream and downstream of the project.

d. Failure to provide timely monitoring causes incidental take statement to expire. If the applicant fails to provide specified monitoring information by March 31, NOAA Fisheries will consider that a modification of the action that causes an effect on listed species not previously considered and causes the incidental take statement of the Opinion to expire.

e. NOTICE. If a sick, injured or dead specimen of a threatened or endangered species is found, the finder must notify the Vancouver Field Office of NOAA Fisheries Law Enforcement at 360.418.4246. The finder must take care in handling of sick or injured specimens to ensure effective treatment, and in handling dead specimens to preserve biological material in the best possible condition for later analysis of cause of death. The finder also has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not disturbed unnecessarily.

3. MAGNUSON-STEVENS ACT

3.1 Background

The objective of the essential fish habitat (EFH) consultation is to determine whether the proposed action may adversely affect designated EFH for relevant species, and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH resulting from the proposed action.

3.2 Magnuson-Stevens Fishery Management and Conservation Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-297), requires the inclusion of EFH descriptions in Federal fishery management plans. In addition, the MSA requires Federal agencies to consult with NOAA Fisheries on activities that may adversely affect EFH.

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting the definition of essential fish habitat: 'Waters' include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; 'substrate' includes sediment, hard bottom, structures underlying the waters, and associated biological communities; 'necessary' means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50CFR600.110).

Section 305(b) of the MSA (16 U.S.C. 1855(b)) requires that:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH;

- NOAA Fisheries shall provide conservation recommendations for any Federal or state activity that may adversely affect EFH;

- Federal agencies shall within 30 days after receiving conservation recommendations from NOAA Fisheries provide a detailed response in writing to NOAA Fisheries regarding the conservation recommendations. The response shall include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the conservation recommendations of NOAA Fisheries, the Federal agency shall explain its reasons for not following the recommendations.

The MSA requires consultation for all actions that may adversely affect EFH, and does not distinguish between actions within EFH and actions outside EFH. Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities, that may have an adverse effect on EFH. Therefore, EFH consultation with NOAA Fisheries is required by Federal agencies undertaking, permitting or funding activities that may adversely affect EFH, regardless of its location.

3.3 Identification of EFH

The Pacific Fisheries Management Council (PFMC) has designated EFH for three species of Pacific salmon: Chinook (*Oncorhynchus tshawytscha*); coho (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*) (PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other waterbodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC), and longstanding, naturally-impassable barriers (*i.e.*, natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the *Pacific Coast Salmon Plan* (PFMC 1999). Assessment of potential adverse effects to these species' EFH from the proposed action is based on this information.

3.4 Proposed Actions

The proposed actions are detailed above in section 1.2, and action area is defined in section 1.3. This area has been designated as EFH for various life stages of chinook and coho salmon.

3.5 Effects of Proposed Actions

As described in detail in section 2.1.5, Analysis of Effects, the proposed activities will result in detrimental short- and long-term adverse effects to a variety of habitat parameters. These impacts include short-term impacts from gravel extraction, and long-term potential adverse effects of changes by ongoing habitat losses due to channel changes. Reduced areas and volumes mined will reduce effects, with recovery potential as the operation phases out and restoration activities are implemented.

3.6 Conclusion

NOAA Fisheries believes that the proposed action will adversely affect the EFH for chinook and coho salmon.

3.7 EFH Conservation Recommendations

Pursuant to section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations for any Federal or state agency action that would adversely affect EFH. The conservation measures proposed for the project by the Corps, all reasonable and prudent measures and the terms and conditions contained in sections 2.2.2 and 2.2.3, respectively, are applicable to salmon EFH. Therefore, NOAA Fisheries incorporates each of those measures here as EFH conservation recommendations.

3.8 Statutory Response Requirement

Please note that the MSA (section 305(b)) and 50 CFR 600.920(j) requires the Federal agency to provide a written response to NOAA Fisheries after receiving EFH conservation recommendations within 30 days of its receipt of this letter. This response must include a description of measures proposed by the agency to avoid, minimize, mitigate or offset the adverse impacts of the activity on EFH. If the response is inconsistent with a conservation recommendation from NOAA Fisheries, the agency must explain its reasons for not following the recommendation.

3.9 Supplemental Consultation

The Corps must reinitiate EFH consultation with NOAA Fisheries if either action is substantially revised or new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR 600.920).

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